



SURVEY NOTES

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Governor's Confab On Geologic Perils

The Governor's Conference on Geologic Hazards will meet on March 7, 1977, at the Hilton Hotel of Salt Lake, as announced by Bruce N. Kaliser, conference chairman. This will be the second conference. The first was held in December 1967. The Governor's Committee on Geologic Hazards in cooperation with the Utah Geological and Mineral Survey sponsors the meeting.

Kaliser encourages all interested persons, including the elected officials of local government, to attend. Panel discussions are to be conducted on geology and planning and on geology and public works in which city and county planners and engineers, as well as earth scientists, will be invited to participate.

According to Kaliser, the conference will call attention to: (1) progress made since the first conference a decade ago; (2) the direction taken by local ordinances and state legislation; (3) case histories of structural failures due to earthquakes, floods, and other natural disasters; (4) "701" and "208" planning accomplishments; and (5) "disclosure," as it occurs under the Utah Land Sales Disclosure Act of 1973.

The sponsor welcomes suggestions, and these should be addressed to Kaliser at the Utah Geological and Mineral Survey. Registration, including luncheon and published proceedings, is expected to be modestly priced at \$12.00, and reservations will be accepted as early as January. Readers of *Survey Notes* are asked to call the conference to the attention of friends, colleagues, and the interested public.

Geothermal Drilling Big In Utah

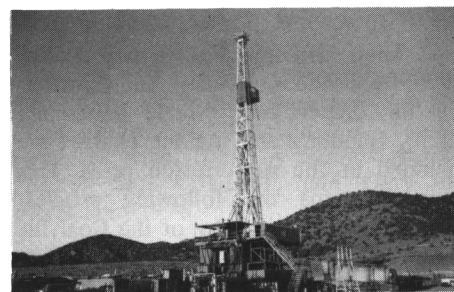
Geothermal drilling has been brisk in Utah thus far in 1976, with deep exploratory wells completed or under way in Beaver, Iron, and Millard Counties.

Two companies have been working in the Roosevelt Hot Springs area of Beaver County, where Phillips Petroleum has already completed six geothermal wells. Phillips has been drilling on a federal lease in sec. 15, T. 27 S., R. 9 W., and will probably drill other sites in the Roosevelt area that have been approved under a plan that calls for 16 wells on its federal leases. Thermal Power has drilled on a State of Utah lease in sec. 2 of the same township.

In Iron County, two deep wells were completed near Beryl by a group of three companies, consisting of Utah Power and Light, McCulloch Oil, and Geothermal Kinetics. One well, in sec. 22, T. 34 S., R. 16 W., was completed in March. The other, in sec. 18 of the same township, was completed in July at a total depth of 12,295 feet. This well yielded quantities of steam and hot water, but according to Dr. Val Finlayson of Utah Power and Light, it does not appear to be commercial. Nevertheless, the geochemistry of the fluids recovered indicates good geothermal potential in the area. Further testing of this well is being considered. The three companies also intend to drill a well in the Lund-Avon area before the end of the year.

In Millard County, Union Oil drilled one well this summer on private land in sec. 29, T. 25 S., R. 6 W. The well was abandoned because of difficult drilling conditions.

More geothermal drilling is expected in Utah during the coming year



Phillips Petroleum's geothermal well is in sec. 15, T. 27 S., R. 9 W., near Milford, Utah. Contractor is Signal Drilling. Basically the same equipment of an oil rig is used in drilling a geothermal well, but extra blow-out preventers are added. Photograph was taken in September 1976. (photo courtesy of the Utah State Board of Education, Curriculum Division)

after new plans of operation on federal leases are approved. On October 5-7, the U. S. Geological Survey conducted a tour of proposed well sites in the Cove Fort-Sulphurdale area and the Roosevelt area. The tour enabled representatives of the U. S. Forest Service, the Bureau of Land Management, the Conservation Division of the U. S. Geological Survey, and other interested parties to gather data for an upcoming Environmental Analysis Report about the area. Union Oil showed to the group 23 proposed well sites in the valley east of Cove Fort and along the mountain front south to Sulphurdale. Phillips Petroleum showed five proposed well sites in the same general area plus one east of Dog Valley.

Phillips also showed six proposed well sites in the eastern part of the Roosevelt area and the route of a proposed pipeline, which will carry water north from production wells across Negro Mag Wash to an injection well.

The current and proposed drilling plans make southwestern Utah one of the most active areas in geothermal exploration in the United States today.

SURVEY RELEASES LATEST STUDIES

The latest publications of the Utah Geological and Mineral Survey are available through the UGMS Publication Sales Office, 606 Black Hawk Way, Salt Lake City, Utah 84108. When ordering by mail, add 10% for handling and mailing charges—minimum charge is \$.25. Mailing charges for maps may vary: see listing of maps for prices.

Utah Geology, Vol. 3, No. 2, Fall 1976. Published biannually. Subscriptions are \$6.00 per year. Single issues are \$3.50. Handling and mailing charges are included in the subscription price. This issue contains the following articles: "Cretaceous Stratigraphy of the Coalville and Rockport Areas, Utah," by Thomas A. Ryer; "Classification of Ripple Marks," by Lee R. High, Jr. and M. Dane Picard; "Distribution in Time and Space of Late Phanerozoic Normal Faulting in Nevada and Utah," by Ann Kramer Loring; "Relict Patterned Ground, Bear River Range, North-Central Utah," by Jerome V. DeGraff; "Type Locality of Walcott's Brigham Formation, Box Elder County, Utah," by Martin L. Sorensen and Max D. Crittenden, Jr.; "Earthquake Epicenters in Utah July-December 1975," by Kenneth L. Cook; and "Bibliography of Utah Geology 1975."

Map 40, Geothermal Gradient Data, Cedar City, Utah, 2° AMS Sheet, compiled by J. A. Whelan. Geothermal gradient data are plotted on a clear tracing vellum that is to overlay the Cedar City, 2° AMS sheet, scale 1:250,000 (\$2.00 over-the-counter; \$2.25 folded and mailed; \$3.00 mailed in tube).

Map 41, Oil and Gas Fields and Pipelines of Utah, compiled by J. A. Campbell and P. L. Driscoll. Map 41 supersedes Map 35 (\$1.00 over-the-counter; \$1.25 folded and mailed; \$2.00 mailed in tube).

Oil and Gas Field Studies 14, Penetration Chart of Utah Oil and Gas Fields, compiled by J. A. Campbell and R. S. Bacon (\$2.50).

UGMS has its unpublished Reports of Investigation on open-file. These

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UGMS TREKS TO THE FIELD

Once again the autumn season of field trips attracted the educational interests of the Utah Geological and Mineral Survey. The last week of September proved to be an active time as the Utah Geological Association and the Rocky Mountain Association of Geologists held their annual meetings in Salt Lake County.

On September 24 and 25 almost the entire geologic staff of UGMS attended the annual field conference of the Utah Geological Association. The Friday session toured the Oquirrh Mountains and vicinity in four-wheel-drive vehicles. At stops along the way geologists from the mining industry and the U. S. Geological Survey described and discussed the stratigraphy, mineralization, and complex structure of the range. On Saturday an all-day guided tour of Kennecott's Bingham open-pit mine gave geologists a rare opportunity for a close-up view of the internal structure of the intrusions, ore bodies, and mineralized zones exposed within the huge mine. A demonstration of precision blasting certainly accented the day. The mine trip was a successful "replay" of the Society of Economic Geologists and the Geolog-

ical Society of America tour in October 1975 that was disrupted by a blizzard.

On September 30 and October 1, the Denver-based Rocky Mountain Association of Geologists convened at Snowbird Resort in Little Cottonwood Canyon, southeast of Salt Lake City, for a two-day symposium and field trip. The subject of the annual meeting was the stratigraphy, structure, and petroleum potential of northern Utah's overthrust belt. The Thursday symposium, at which 13 papers were presented, was attended by more than 300 geologists from all parts of the U. S. On Friday about 285 geologists toured by bus the key outcrop areas in the northern Wasatch Mountains near Coalville and Wanship. At the new and prolific Pineview oil field, the geology of the overthrust structure was discussed, within sight and sound of five drilling rigs. Among the local geologists participating in the trip as bus guides were Dr. James Baer (Brigham Young University), James Madsen (University of Utah), Dr. Richard Moyle (Weber State College), and Jock Campbell and Howard Ritzma (UGMS). Speakers at stops included Madsen, Campbell, and Lyle Hale, a consultant.

CO₂: BENEFIT TO OIL RECOVERY

Not too many years ago a company exploring for oil was dismayed when a top-rated drilling prospect turned out to be a natural gas discovery, especially when the gas was discovered a long way from the nearest pipeline. And with gas prices kept artificially low for decades, some gas discoveries were "scientific triumphs but economic disasters" for many an unlucky explorer.

Even more dismaying was the well that drilled into a reservoir of gas that would not burn, usually carbon dioxide mixed with other nonflammable gases such as nitrogen, hydrogen sulfide, or traces of helium.

Today, with natural gas a precious commodity, few wells with sizable quantities of flammable gas within reasonable distance of a pipeline still remain unconnected to a gas-gathering system. And even more significant is the sudden

interest in nonflammable gases, particularly carbon dioxide (CO₂), which occurs in great volume in many areas of the U. S.

Some CO₂ is consumed in making dry ice and in other industrial uses; but most has remained shut in or, where produced with oil or flammable gas, has been separated out and vented to the air.

In the last year or so, carbon dioxide has suddenly become the subject of increasing lease activity and the target for exploratory drilling. The reason: the effectiveness of CO₂ injected into oil reservoirs to stimulate production of additional oil, a process known as the CO₂ miscible flood. The process has proven particularly effective in fields that produce from carbonate rocks (limestone or dolomite). As the nation's domestic reserves decline steadily, recovery of additional oil from existing fields is becoming

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ON UTAH GEOLOGY . . .

U.S. Geological Survey Open-File Reports

Unpublished reports by the U. S. Geological Survey that describe the geology of Utah are kept on open-file at the Utah Geological and Mineral Survey, 606 Black Hawk Way, Salt Lake City. Because UGMS has only one copy of each on hand, the reports must be inspected at its offices and cannot be taken out. Copies of these reports may also be inspected at the USGS Public Inquiries Office, Federal Building, 125 South State Street, Salt Lake City, where reproducible copies are sometimes available.

USGS open-file reports that have been received at UGMS since January 1975 are:

75-101. *Preliminary Unevaluated Map Showing Distribution of Organic Carbon in Meade Peak and Retort Members of the Phosphoria Formation (Permian) in Parts of Utah, Idaho, Wyoming, and Montana*, by Edwin K. Maughan, 1975.

75-131. *Computer Program to Simulate the Salt Balance Between the North and South Parts of Great Salt Lake, Utah*, by K. M. Waddell and E. L. Bolke, 1975. Prepared in cooperation with the Utah Geological and Mineral Survey.

75-382. *Mineral Resources of the Lone Peak Wilderness Study Area, Utah and Salt Lake Counties, Utah*, by Calvin S. Bromfield, USGS and Lowell L. Patten, USBM, 1975, with a section on "Interpretation of Aeromagnetic data" by Don R. Mabey, USGS.

75-436. *Geochemical Survey of the Western Coal Regions, Second Annual Progress Report, July 1975*, by the U. S. Geological Survey, 1975.

75-588. *Explanation and Sources of Data for Preliminary Geologic Map of East Half of Vernal 1° x 2° Quadrangle, Colorado*, by Ogden Tweto, 1975.

75-616. *Unevaluated Reconnaissance Geologic Maps of Salt Lake and Davis Counties West of the Wasatch Front, Utah*, by Richard Van Horn, 1975.

76-52. *Leveling Data from the Epicentral Area of the March 27, 1975, Earthquake in Pocatello Valley, Idaho*, by R. C. Bucknam, 1976.

76-89. *A Study of Earthquake Losses in the Salt Lake City, Utah, Area*, by the U. S. Geological Survey, 1976.

76-200. *Preliminary Reconnaissance Study of Lower and Lower Upper Mississippian Strata Across Northwestern Utah*, by Raymond C. Gutschick, 1976.

76-238. *Depositional Environments as a Guide to Uranium Mineralization in the Chinle Formation, San Rafael Swell, Utah*, by Robert Lupe, 1976.

76-245. *Audio-Magnetotelluric Data Log, Station Location Map and Skin Depth Pseudo-Sections, Crater Hot Springs Known Geothermal Resource Area, Utah*, by R. M. Senterfit and G. M. Bedinger, 1976.

76-287. *Preliminary Investigation of the Elemental Variation and Diagenesis of a Tabular Uranium Deposit, La Sal Mine, San Juan County, Utah*, by Robert A. Brooks and John A. Campbell, 1976.

76-303. *Geology of the North End of the Salt Valley Anticline, Grand County, Utah*, by Leonard M. Gard, Jr., 1976.

76-381. *Mineralogy of Oil Shale in the Upper Part of the Parachute Creek Member of the Green River Formation in the Eastern Uinta Basin, Utah*, by George A. Desborough, 1976.

76-386. *Coal Resources of the Alton, Utah, EMRIA Site*, by W. E. Bowers, A. A. Aigen, and E. R. Landis, 1976.

76-410. *Audio-Magnetotelluric Data Log and Station Location Map for Lund Known Geothermal Resource Area, Utah*, by Susan Gardner, Jackie M. Williams, and Donald B. Hoover, 1976.

76-411. *Audio-Magnetotelluric Data Log and Station Location Map for Monroe-Joseph Known Geothermal Resource Area, Utah*, by Susan Gardner, Jackie M. Williams, and Gary W. Brougham, 1976.

76-412. *Audio-Magnetotelluric Data Log and Station Location Map for Thermo Known Geothermal Resource Area, Utah*, by Susan Gardner, Jackie M. Williams, and Carl L. Long, 1976.

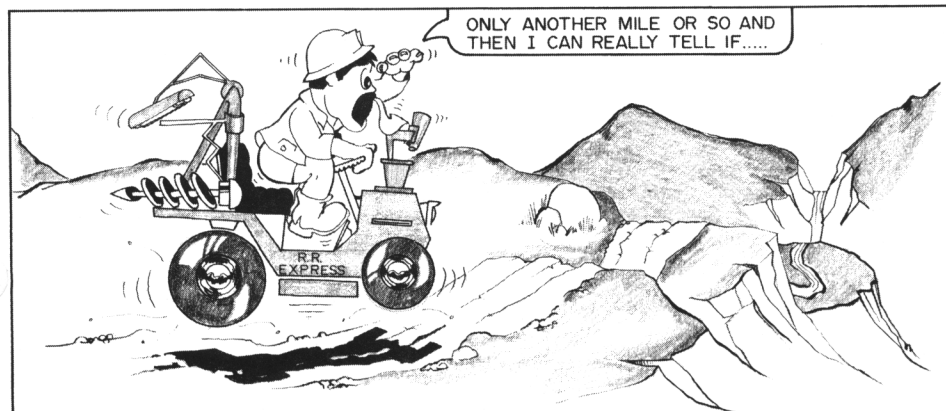
76-416. *A Probabilistic Estimate of Maximum Acceleration in Rock in the Contiguous United States*, by S. T. Algermissen and Davis M. Perkins, 1976.

76-421. *Helium Sniffer Field Test: Newcastle, Utah*, by Edward H. Denton, 1976. 10-26 March 1976.

76-674. *User's Guide to the Radiometric Age Data Bank (RADB)*, by Robert E. Zartman, James C. Cole, and Richard F. Marvin, 1976.

76-755. *A Potential Target for Potash Solution Mining in Cycle 13, Paradox Member, near Moab, Utah*, by Robert J. Hite, 1976.

ROCKY RIDGES



by Greg McLaughlin



Ground-Water Quality In Utah

by B. N. Kaliser
Chief Engineering Geologist

Editor's note: This article appeared in slightly different form as "Groundwater Quality Aspects of Utah's Expanding Communities" in Impacts of Energy Development on Utah Water Resources, Proceedings of the 3rd Annual Conference, American Water Resources Association, Utah Section, Salt Lake City, 1975, p. 243-246.

Increasing population resulting from energy and mineral resource-related developments in Utah is rapidly increasing requirements for additional municipal services. Existing water and sewage facilities are becoming overtaxed and officials at all levels of government are desperately trying to cope with the situation. The accompanying table illustrates this expected population growth in two parts of the state.

There is normally a considerable lag between the time at which demands are first felt and the time at which financing is made available for public utilities. Installation comes even later. With regard to water, families or subdivisions frequently are required to dig water wells. Since the requirements are principally for domestic water, individuals use shallow ground water whenever possible. Each residence is likely to install an individual sewage system—probably, in Utah, a septic tank with drainage field.

Many geologic environments are being encroached upon for the first time. The hydrogeologic regime in many of these areas, though in semiarid to arid climatic zones, is sensitive as far as water quality is concerned. Ground water in bedrock may be of lower quality than ground water in overlying soil materials,

depending upon the bedrock lithologies and distances of migration for the included ground water. Exploration for suitable aquifers in bedrock and sophisticated procedures of pump testing of individual water zones and well construction are usually too costly for a single residence's requirements. Wherever possible there will be emphasis upon the shallow unconfined water table in soil, a situation which is more prevalent than many people realize in Utah.

Protection of the quality of this vital shallow water resource is very important. Because of its widespread occurrence just below the surface, just out of sight, the ease with which it may be affected is not readily appreciated. In any areas where developments are foreseen, exploration of the hydrogeologic regime should precede urban or other encroachment. Recommendation may thereby be made for adequate disposal of all waste. Mobile home communities have similarly serious problems with requirements for water and waste disposal and today such communities are more permanent than they once were. With their location just outside city limits, occupants may bring animals along with them. The relatively small yards concentrate animal wastes as well as other possible wastes on the surface. The hydrogeologic regime may be such that precipitation or irrigation waters may have direct access to the water table close to the ground surface. Soil materials may be clean, coarse-grained sand or gravel and therefore offer no potential for filtration of the down-

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Expected population growth in two areas of Utah.

	Population		
	1970	1975*	1980
Uinta Multicounty Planning District (Uinta, Duchesne, Daggett Counties)	20,648	30,100	37,133 (l) 53,440 (h)
Five County Planning District (Beaver, Iron, Garfield, Kane, Washington Counties)	35,224	42,700	55,184 (l) 91,884 (h)

* = Utah State Population Work Committee figures for July 1975.

l = low estimate, State Planning Coordinator.

h = high estimate, State Planning Coordinator.

Gas Danger On Wasatch Front

One offshoot of the thinking and study generated by the Pocatello Valley earthquake of March 27, 1975, was a study of the potential hazard from accumulations of combustible gases along the Wasatch Front. The sources of such gas are both natural and man-created, and the hazard of explosion and fire is present under everyday static conditions and may be critical in the event of a strong earthquake.

In the study, gas was found to emanate from several sources. Nearly pure methane (marsh gas) is being continually generated from decaying organic matter, under aerobic and anaerobic conditions, in marshes in and near the urban environment. This gas accumulates in reservoirs in the sediments of Quaternary and Recent age. And the migration of more mature "natural" gas from deeper Tertiary sediments into these shallow sediments is also a distinct possibility.

The continuous generation of combustible gas occurs at a number of solid-waste disposal sites. Sewer gas is generated in sanitary sewer systems. Gas and vapors from oil, gasoline, and gas spills and leaks are also found with greater frequency in urban environments.

The systematic program of gas "sniffing" conducted by the Utah Geological and Mineral Survey covered 487 stations in the Salt Lake and Utah valleys from Corrine and Brigham City on the north to Payson on the south. Among the conclusions reached were:

1. Ground cracking resulting from a moderate or strong earthquake along the Wasatch Front could release combustible gas presently entrapped in natural, shallow subsurface reservoirs and in solid-waste disposal sites.

2. Sewer lines and buried fuel tanks are vulnerable to rupture when connections are severed as the result of earthquakes. Under dynamic loading such as in an earthquake, fuel tanks in the shallow ground-water environment of the Wasatch Front may also have a tendency to lift out of the ground, thus severing connections and leaking fluid and vapors.

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GEOLOGIST JOINS UGMS

David H. Crockett has been employed by the Utah Geological and Mineral Survey to head its new Environmental Geology Section. He will direct environmental programs with particular emphasis on the metropolitan Wasatch Front region.

Mr. Crockett was employed by the U.S. Forest Service in 1961. He was the Regional Geologist of the Inter-mountain Region headquartered in Salt Lake City until his transfer to Washington, D. C., in 1975 as Principal Geologist of Geologic Services for the Forest Service. His responsibilities included engineering geology, geohydrology, and mining geology on all national forest lands. He graduated from the University of Utah in 1951 and was employed by the Utah State Land Board prior to service with the U. S. Forest Service.



GROUNDWATER QUALITY

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ward migrating polluted water. From these same shallow aquifers comes the culinary water tapped by wells. The hazard is obvious, but it is one that can be assessed. Necessary protective measures can be taken prior to any development.

In the event that the shallow ground water is already unsatisfactory in quality for domestic culinary use, baseline studies should still be conducted prior to developments. Perhaps the quality can be enhanced. A change of irrigation or grazing practices in the recharge area may occur. Water of subculinary quality is still a resource and perhaps a no less valuable resource at that. There must come a time in Utah and throughout the West, if indeed not throughout the country, when all waters will be used fully. Shallow ground water may be exploited at minimal cost and stored at no cost to man, either for construction or maintenance. Even aesthetic considerations are nil. But man has yet to learn to appreciate these facts and, where necessary, to draw differing quality waters from different subsurface reservoirs to accommodate different needs.

There is much to be gained by a better approach to the use of shallow

ground water. Intentional lowering of the shallow water table may save a number of communities in Utah from serious financial problems, particularly those cities and towns that are faced with the severe problem of infiltration of ground water into the sewage collection system and are treating needless quantities of diluted wastewater.

A means of wastewater treatment in Utah that is growing in popularity is the sewage lagoon. It too requires proper siting with respect to hydrogeologic regimes. One must consider that under static conditions lagoon cells may eventually leak effluent. Under dynamic loading, such as an earthquake, there may be failure of the substratum or the earth embankments comprising the lagoon.

The generation of greater quantities of solid waste leads to the need to locate additional sites for sanitary landfills. It is no less important that they, too, be properly sited. All manner of deleterious substances normally end up in a solid waste operation. Some items may contain concentrations of trace elements, which, should they reach the ground-water regime, might disperse to contaminate a significant subsurface reservoir of otherwise exceptional quality water.

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UGMS Abstracts Mineral Valuations

Information from the Mineral Property Division of the State Tax Commission abstracted by the Utah Geological and Mineral Survey shows that assessed valuation of mining and oil and gas properties in Utah increased only 1.7 percent from \$493,052,022 in 1975 to \$501,433,198 in the current year. This is in marked contrast to the 33 percent increase recorded from 1974 to 1976. Mining property valuation decreased from \$298.6 million to \$266.9 million in 1976 mainly because of a \$46 million decrease in net proceeds to Kennecott Copper Corporation. Valuation of oil and gas properties continued to increase dramatically from \$84.2 million in 1974 to \$194.4 million in 1975 and then to \$234.6 million in 1976.

Mine occupation tax assessed in 1976 was \$8,571,686 of which \$6,613,121 (77 percent) was on oil and gas properties. Shell Oil paid the most, \$1,119,231, on its Altamont field properties. Chevron paid \$767,803 on its Bluebell properties, and Texaco paid \$745,015 on its part of the Greater Aneth field.

Kennecott Copper paid \$1,588,003 on its Utah Copper Division mine properties. Other mine valuations were Rio Algom Corporation's Lisbon uranium properties—\$83,279 and Chief Consolidated Mining's Burgin property—\$69,948.

CHAPITA WELLS REVISITED

Belco Petroleum, New York City, has announced a program of exploratory and developmental drilling in several western states, including a drilling program to revive production in the Chapita Wells gas field in Uintah County, Utah. This field, discovered in 1952 by Continental Oil and partly developed by Belco in the late 1950's and early 1960's, is thought to contain significant additional reserves of gas. The total program is to cost \$22 million.

Breakwater Ready At New State Park



Breakwater on the north side of Silver Sands Marina: *Left:* The remains of the breakwater after the severe storm of April 25. Extensive damage occurred to the boats and facilities in the harbor. Photograph was taken on April 28. *Right:* The new breakwater, raised 9 feet above the old structure and buttressed by gabions, stands ready for another season of storms. Photograph taken in early August. (UGMS photos)

WATER LEVELS OF GREAT SALT LAKE

The Great Salt Lake receded 1.85 feet from its high level for 1976 recorded on June 1 to its probable seasonal low of 4,200.40 feet recorded during early October. The annual rise of the lake from its autumnal low to spring peak has averaged 2.4 feet for the past five years, ranging from 2.15 to 2.60 feet. On October 15, 1975 the level was 4,199.90 feet.

Great Salt Lake levels recorded (in feet above sea level) by the USGS are:

Date	Boat harbor (south arm)	Saline (north arm)
August 1	4,201.25	4,199.80
August 15	4,200.90	4,199.65
September 1	4,200.70	4,199.50
September 15	4,200.50	4,199.40
October 1	4,200.40	4,199.25
October 15	4,200.40	4,199.20

Cliff Dwellers

The *Cliff Dwellers*, a five part series, was aired by Utah's CBS affiliate, KSL-TV, September 20-25. The series was suggested early in the year by Bruce N. Kaliser, Utah Geological and Mineral Survey's engineering geologist, to promote public awareness of geologic hazards in Utah's megalopolis, the Wasatch Front. In addition to outlining the program's content, Kaliser accompanied the TV crew in the field and subsequently advised KSL on specific topics.

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Rich County Tests

Rich County, which never had a test for oil and gas drilled within its borders, now has two drilling rigs operating. Both wells are operated by American Quasar Petroleum of Fort Worth, Texas, the same company credited with the discovery of the new Pineview field east of Coalville, Summit County. One test, the No. 1 Hoffman, NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T. 11 N., R. 7 E., scheduled to 11,000 feet in the Madison Limestone (Mississippian age), is about 1 mile southwest of Randolph. The second well, only recently announced, is the No. 23-1 Putnam, SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, T. 9 N., R. 6 E. Scheduled to 12,500 feet to test Devonian formations, this well is about 6 miles west-southwest of Woodruff near Woodruff Creek Reservoir. The well near Randolph is being drilled by the R. L. Manning Company. Noble Drilling Corporation is the contractor for the second Rich County test.

Correction

On page 3 of the August 1976 issue of *Survey Notes* (Vol. 10, No. 3), the decrease in value of Utah's mineral income was attributed to "less copper production and a decrease in copper prices from \$1.77 per pound to about \$1.63." These figures, of course, should have read \$.77 to \$.63 respectively. Later, on page 8 of the same article, we quoted the correct prices.

However, we regret the first error as much as those persons who regret that prices had not really been that high.

LATEST STUDIES

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recent reports may be examined at the UGMS offices:

Report of Investigation No. 109, *Exploration for Fluid Waste Disposal Site, Brighton, Salt Lake County*, by Bruce N. Kaliser, July 1976, 4 p.

Report of Investigation No. 110, *Preliminary Geologic Reconnaissance for Sanitary Landfill Sites for City of Moab, Grand County*, by Bruce N. Kaliser, August 1976, 4 p.

Report of Investigation No. 111, *Hey Joe Property, Grand County, Utah*, by Larry Trimble, September 1976, 5 p.

UGMS acts as sales agent for the following recent publication, which it did not produce:

Utah Geological Association Publication No. 6, *Guidebook to Geology of the Oquirrh Mountains and Regional Setting of the Bingham Mining District, Utah*, edited by W. W. Atkinson, Jr. (\$3.00). The *Guidebook* contains 36 pages and includes a road log, the abstracts of talks at stops, and numerous maps and illustrations.

HELP NEEDED ON ROCKHOUND BOOK

The Utah Geological and Mineral Survey and the Mineralogical Society of Utah need help on their rockhound book. The joint project, already months in preparation (see *Survey Notes*, Vol. 10, No. 2, May 1976), will produce a UGMS bulletin on the gem, mineral, and fossil localities in Utah. This publication should be invaluable to rockhound interests throughout the state.

Detailed information is needed on occurrences of all sorts—their location, the access to them, and their references in geologic and rockhound literature. Personal field-trip logs, maps, sketches, and notes will be especially welcome.

Information should be forwarded by mail or in person to Carlton H. Stowe of UGMS. All contributions will be credited as to their source.

GAS DANGER

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3. The high water table that exists along the Wasatch Front acts as a transporter of leaked gasoline into confined and unconfined shallow reservoirs and excavations.

4. The increased use of low-lying lands with high water tables as sites for buildings and sanitary land fills presents a potential hazard from combustible gases that would be released by ground shaking during an earthquake.

Details of the study are contained in UGMS Report of Investigation 108 which is on file at the UGMS offices. The report was prepared under a U. S. Geological Survey Earthquake Hazard Reduction Program grant and is possibly the first such study undertaken in the nation.

CLIFF DWELLERS

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Each segment was aired sometime during the news program, three times daily.

Cooperation in efforts such as this furthers UGMS' role in educating the public on environmental geology. Perhaps the time has come when the consumer is giving more attention to his most valuable asset—his home site.

GROUNDWATER QUALITY

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Recognizing that there are factors to consider other than the hydrogeological, it is nevertheless important that this factor not go ignored. Officials in Utah's cities and towns are becoming more alert to the situation and are facing up to possible future needs. They and their engineers are involved in preparing population estimates, acquiring necessary land and easements, submitting applications for financial assistance, gaining approvals from regulatory agencies and designing facilities to accommodate the population growth. Let's not forget, however, that the terrain evaluation should come early enough in the procedure so that the conclusions prove to be a help and not a hindrance in identifying and overcoming any potential ground-water pollution problems.

SHALE WORK SLOWS

A one-year suspension of operations on Utah's two prototype oil shale lease tracts has been granted by the U. S. Department of the Interior to the lessee, White River Shale Oil Company.

During the suspension White River will not have to pay the annual \$24 million lease bonus. Three such payments have already been made. Environmental monitoring and planning for mining and production will continue.

LATE NEWS ON GEOTHERMAL

The Beaver County News, Milford (October 21, 1976) reports the completion of two commercial geothermal wells during the previous week, both in the Roosevelt Hot Springs KGRA (Known Geothermal Resource Area). The first successful well, a Phillips Petroleum venture, is the sixth well to produce commercial quantities of steam for that company in the Roosevelt area. The second success was scored by Thermal Power. Both contract drilling rigs have moved to other locations. Additional testing is reported under way at the newly completed commercial wells.

The Loffland Brothers rig drilling for Thermal Power was moved about 2½ miles southwest. According to even more recent reports, the drillers found large amounts of high pressure steam at shallow depth at this location. Large quantities of heavily weighted drilling mud were used to control the threatened blowout. This well is close to one that blew out eight years ago, before the geothermal potential of the area was widely recognized.

Is Your Library Complete?

The Fall 1976 issue of *Utah Geology* is hot off the press (see page 2, "Survey Releases Latest Studies").

Utah Geology has been a great success for the Utah Geological and Mineral Survey. Published twice a year—Spring and Fall—*Utah Geology* carries short articles of interest on the geology of Utah. The title of the magazine really says it all.

No library is complete without *Utah Geology*. The information is invaluable and the rate is reasonable—\$6.00 per year. Don't miss future issues.

A MAGAZINE ON UTAH'S GEOLOGY

Please enter my subscription for the Utah Geological and Mineral Survey's *Utah Geology* for 1 year, beginning with the Fall 1976 issue. Payment is enclosed.

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CO₂: BENEFIT

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a matter of great economic importance and national defense urgency. The stakes are high: the billions of barrels of oil locked up in fields already discovered and producing, oil ready to be "discovered" without the expense of exploration.

In the Rocky Mountain Region active leasing and drilling for CO₂ reserves is under way in Colorado and New Mexico, and lease activity is reported in parts of Utah. Shell Oil is one company reportedly engaged in the Farnham Dome area of Carbon County, Utah. Farnham Dome has been a CO₂ producing field since 1953 and supports a small processing plant. Other Utah areas of interest include San Arroyo gas field, Grand County; Woodside and Ferron anticlines, Emery County; Gordon Creek anticline, Carbon County; and the Escalante structure, Garfield County.

It is proposed to move large volumes of CO₂ by pipeline for use in miscible floods of large fields in west Texas. New reserves drilled in southern Colorado and northeast New Mexico seem headed in that direction. Possible areas in Utah and western Colorado for the CO₂ miscible floods are the Greater Aneth field, San Juan County; Rangely field, Rio Blanco County, Colorado; and the giant Greater Altamont-Bluebell field, Duchesne County.

State of Utah—Department of Natural Resources
UTAH GEOLOGICAL AND MINERAL SURVEY
606 Black Hawk Way
Salt Lake City, Utah 84108

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UGMS Gathers Oil Reserve Data

A pilot program to compile data on the size of the nation's oil resource has been undertaken by the American Association of Petroleum Geologists. The program known as PREP (Petroleum Resource Estimation Project) is expected to correct and supplement several previous estimates, made by Federal agencies, oil industry groups, individual companies, and consulting firms, which have varied widely and have been criticized as lacking factual basis and objectivity.

The present study combines information from a number of sources considered knowledgeable and accurate—Federal and State regulatory agencies and oil company and private consulting files. The project will compile statistics in three main categories: cumulative production of oil from existing fields, reserves of oil in existing fields (measured, probable and possible), and undiscovered oil that may be found in exploratory "plays" of various types.

At present the project covers only a small number of basins in the Rocky Mountain region. This limited effort is designed to test whether the methods being used are valid and applicable to the rest of the U. S.

One of the basins under study is the Paradox-San Juan in southeast Utah and adjacent Colorado, New Mexico, and Arizona. Howard Ritzma, Assistant Director of the Utah Geological and Mineral Survey, represents Utah on the project compiling the data. Other members represent oil and gas companies, the U. S. Geological Survey, and the state surveys of Colorado and New Mexico.

Old Edition Survives

A request by UGMS (made through the newsletters of several regional geological organizations) for a complete copy of the 1949 edition of *Oil and Gas Possibilities of Utah* met with worthwhile response. A copy of the volume and a complete set of accompanying plates was contributed to UGMS by Odessa Natural Corporation, Odessa, Texas. It will be a valuable "spare" for the single specimen of this endangered species now in UGMS captivity.

UTAH GEOLOGICAL AND MINERAL SURVEY SURVEY NOTES

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